FFI Forsvarets forskningsinstitutt

Clothing and Protection in the Norwegian Soldier Modernisation Program NORMANS

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Clothing and Protection in the Norwegian Soldier Modernisation Program NORMANS

Evaluations and tests for different type of protection are focused on the total combat suit.

Integrated Clothing and Protection

Chemical and Biological protection

Fire protection

Climate protection

Ballistic protection

Camouflage

The Integrated Chemical Protection

Combat suit in ”Goretex” as an outer layer

Absorbing inner liner based on active carbon

Red alert level

Yellow alert level

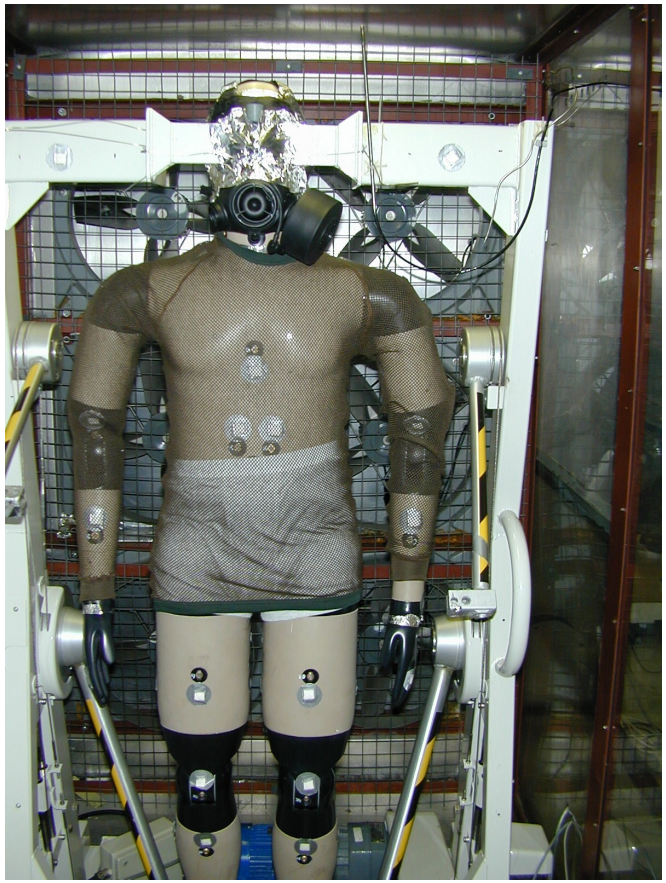
While open, heat stress is reduced by ventilatio

Hood of the combat jacket is adapted to the BC-hood and the gas mask

Norwegian strategy for NBC-clothing

- Use the ordinary combat suit as the first protective layer (membrane fabric) and a sorptive material in the second protective layer which is a inner liner fit to the inside of the combat suit
- The clothing system should be ready for protection in only some seconds (from yellow to red alert level)
- The heat load at activity from the NBC-clothing should be low during the yellow alert level
- The NBC-sensors on the soldiers should be connected to the soldiers communication system
- The sorptive layer can also been used as an insulation layer

Evaluation of the chemical protection - Mannequin



- Mannequin - Movable arms and legs (wind: 5 m/s)

- Non-toxic simulant for mustard agent vapour: Methylsalicylate

- Passive samplers on the mannequin

(placed on about 60 different spots)

Measurements made at TNO-PML in The Netherla

Evaluation of the chemical protection – Results

- The integrated chemical protection used in NORMANS: Considerable better than the Norwegian protective suit NM 143
- The protection changes at different places on the body
- Breast/abdomen and neck are special vulnerable regions

Measurements made at TNO-PML in The Netherlands

Evaluation of the chemical protection at our institute FFI with humans.

(MethylSalicylate, a simulant for mustard gas, is used)

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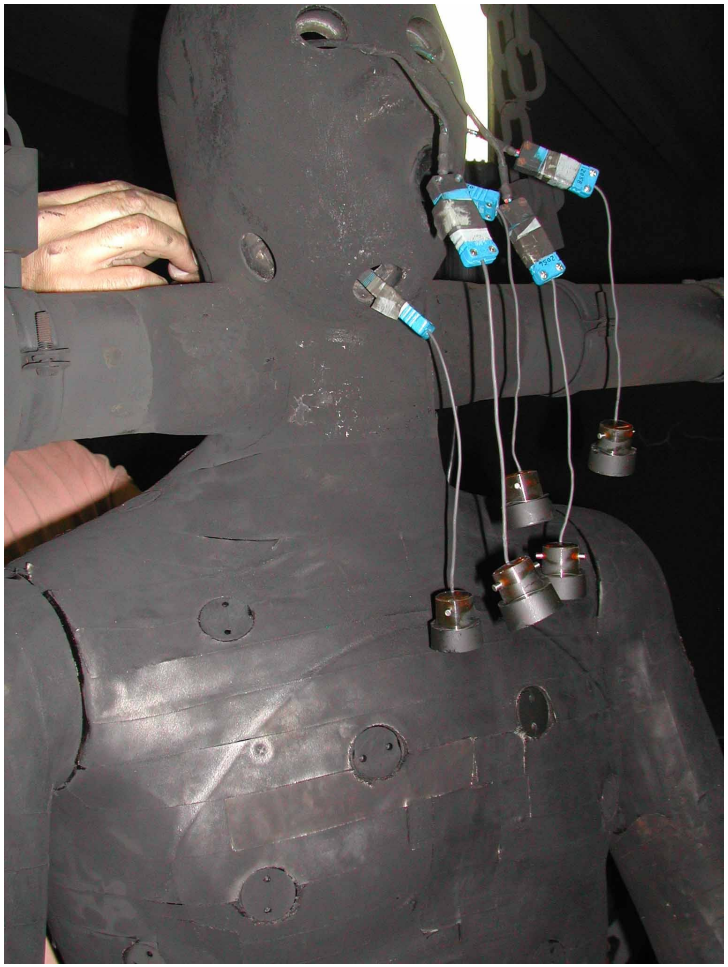
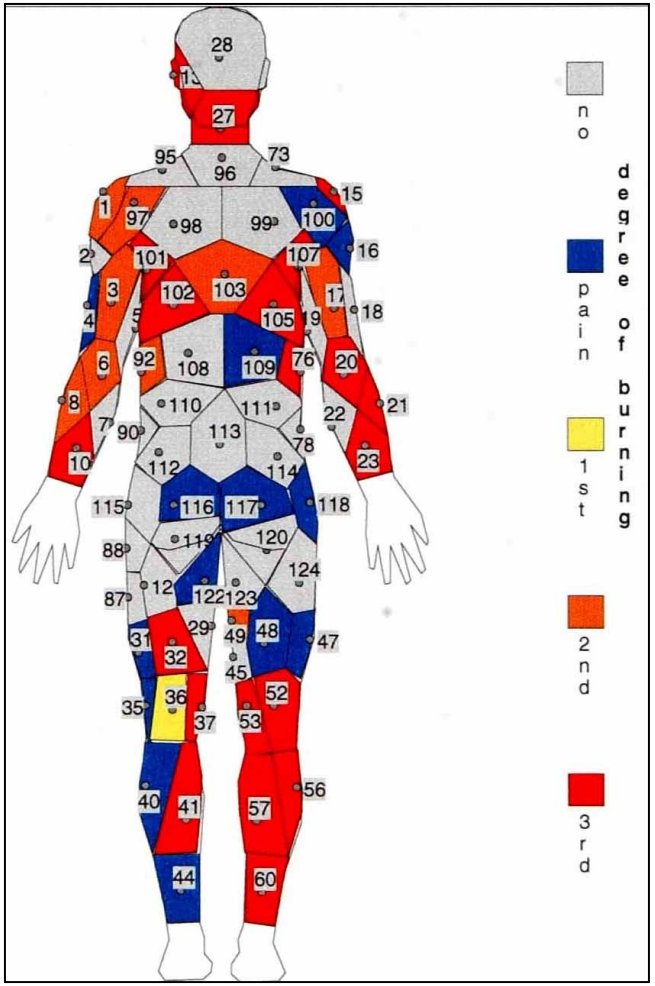
Fire protection – The whole system test

Mannequin with Sensors



One example of the results



Tests made at EMPA in Switzerland

Fire protection – The whole system test

Dressed mannequin with Flamethrowers

- 10 flamethrowers at two different hight

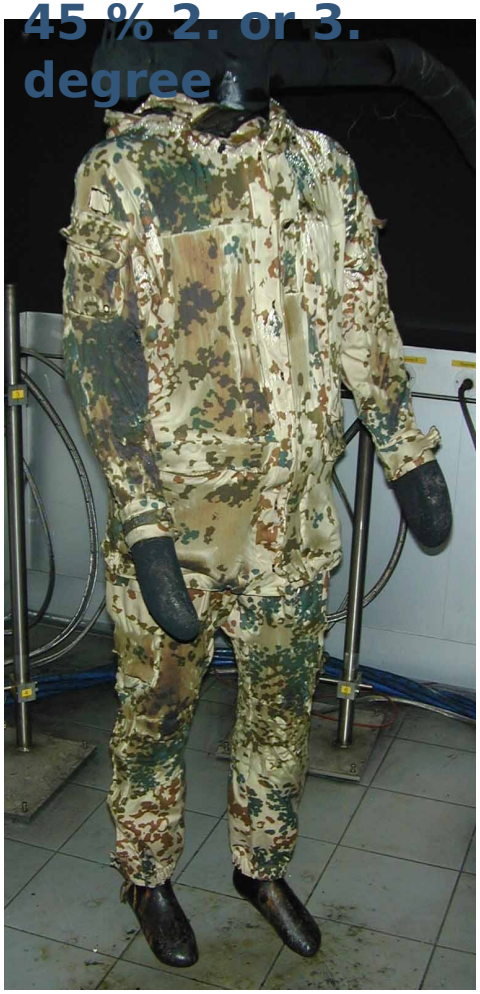
- Gives a heat energy flux exposure of 84 kW/m² in 4 seconds

Tests with three different combat suits

In Cotton
82 % 2. or 3. degree

In polyamid (Goretex)
64 % 2. or 3. degree

In Nomex
45 % 2. or 3. degree



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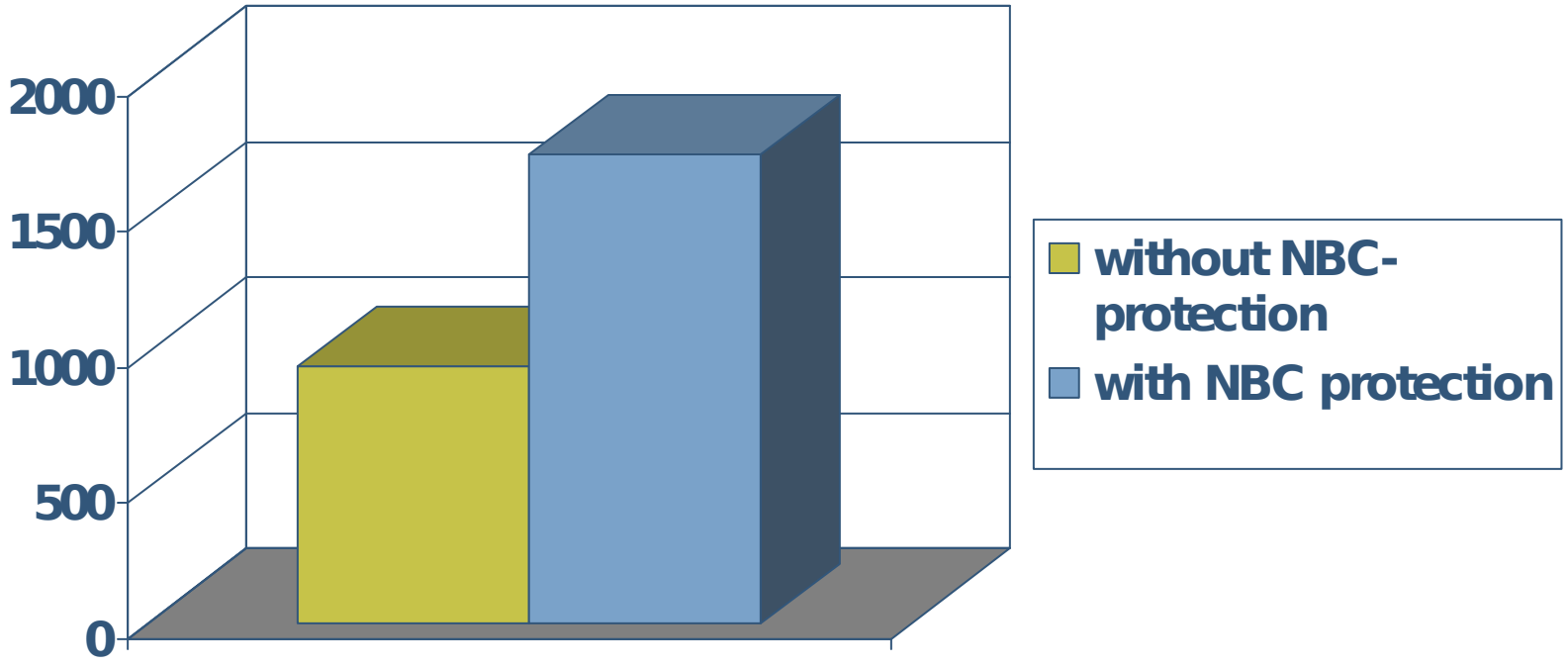
Evaluation of Clothing in a Climate Chamber

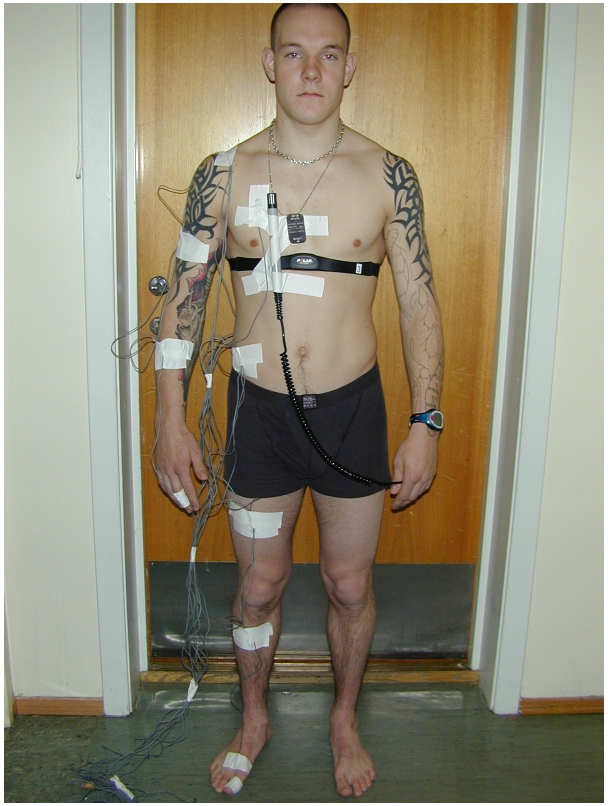
- Heat load during high activity
- The insulation of the clothing
- The water-proofness of the clothing

Heat Load Expressed by Sweat Loss with and without NBC Protection (NM143)

[Climate Chamber Studies at -15°C for 2 Hours]



Field Trial with NBC-protection:
The NORMANS concept and protective suit NM-143

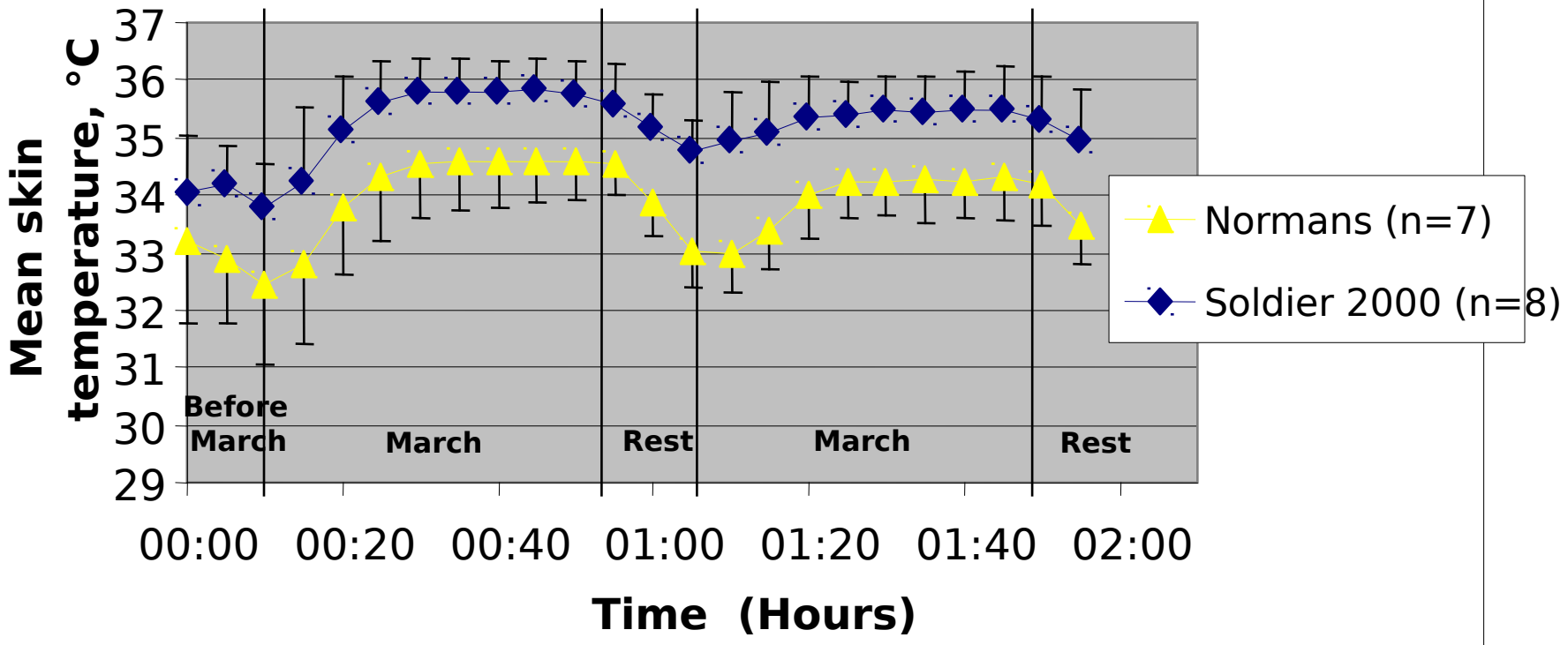


50 min walk – 10 min rest (2 times)

Measuring ski and heart rate

Mean skin temperature for Normans with C-protection and Soldier 2000 with todays NBC-suit-(NM-143) during 2 hours marching

(5,5 km/h on a plain road, 1°C)



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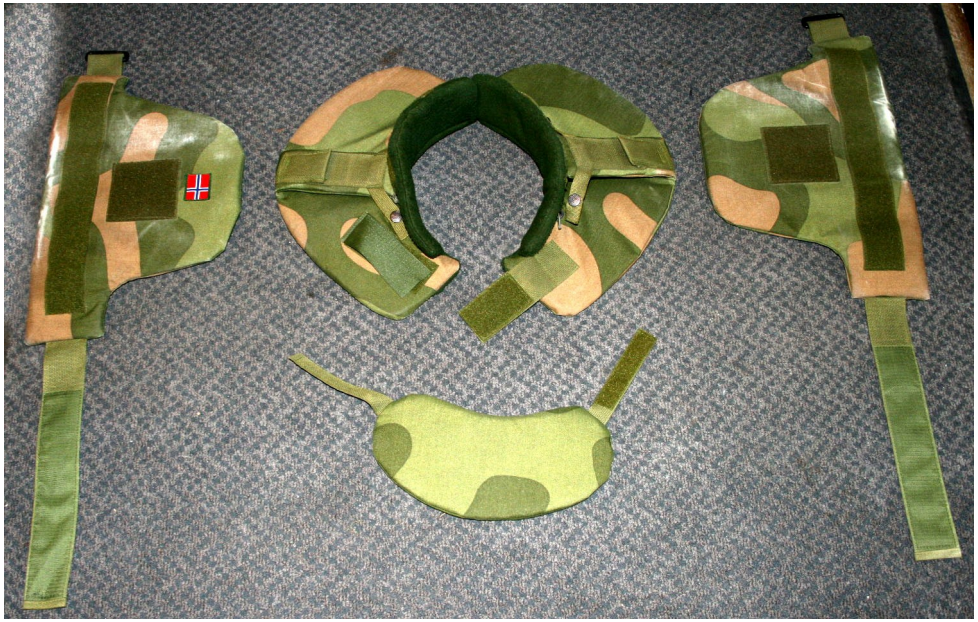
A vest close to the body

- ballistics ceramic plates can be placed in pockets both in front and back
- Water supply system can also be placed in one of the pockets in front or back

Ballistic protection – The neck/shoulder protection (in 4 separate pieces (top) and all pieces assembled (right).



Ballistic protection –
The neck/shoulder protection

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Camouflage

CAMOUFLAGE VISIBLE

Soldier 2000 NORMANS

CAMOUFLAGE IR

Soldier 2000 NORMANS with visor down

Thank you
for your attention !